

FORM PTO-1449 U.S. Dept. of Commerce Patent and Trademark Office AUG 25 1998 INFORMATION DISCLOSURE STATEMENT (use several sheets if necessary)	ATTORNEY DOCKET NO.	SERIAL NO.
	2771-221	09/012,679
	APPLICANT	
	Gautam Bhandari and Thomas H. Baum	
	FILING DATE	GROUP
	1/23/98	1763 1629

U.S. PATENT DOCUMENTS							
EXAMINER INITIAL		PATENT NUMBER	ISSUE DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
<i>[Signature]</i>	AA	2,839,421	6/58	Albisetti	106	287.17	
<i>[Signature]</i>	AB	3,076,834	2/63	Norton	556	175-X	
<i>[Signature]</i>	AC	5,204,314	4/93	Kirlin, et al.	505	001	
<i>[Signature]</i>	AD	5,711,816	1/98	Kirlin, et al.	118	726	
<i>[Signature]</i>	AE	3,437,516	1969	C. Tamborski	117	107.2	

FOREIGN PATENT DOCUMENTS							
		DOCUMENT NUMBER	PUBLICATION DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES NO
<i>[Signature]</i>	AF	GB 976,573	1964 Nov. 23, 1964	Britain			
<i>[Signature]</i>	AG	DE3447635A1	July 18, 1985	Germany			Abstract only

OTHER DOCUMENTS (Including Author, Title, Journal-Date, Page Number, Etc.)							
<i>[Signature]</i>	AH	Yu. E. Ovchinnikov, et al. "The Crystal Structures of the Titanium-Containing Organosilicon Compounds (SiMe ₃) ₃ and (SiMe ₃) ₃ GeTi(Nme ₂) ₃ " <i>Metalloorg. Khim. (Organometallic Chem. In USSR)</i> , 1992, Vol.5, p. 564.					
<i>[Signature]</i>	AI	Yu. E. Ovchinnikov Yu. T. Struchkov M. V. Ustinov, M.G. Voronkov, "Crystal and Molecular Structure of Organosilicon Derivatives of Titanium (IV) (Me ₃ Si) ₃ SiTi(Net ₂) ₃ and CiTi[N(SiMe ₃) ₃] ₃ <i>Izu. Akad. Nauk SSSR, Ser. Khim.</i> , 1993, p. 1473.					
<i>[Signature]</i>	AJ	M.T. Bohr, "Scaling of High Performance Interconnects", <i>Advanced Metallization and Interconnect Systems for ULSI Applications in 1996</i> , MRS Publishers, 1997, p.3.					
<i>[Signature]</i>	AK	M.B. Small, D. Pearson, "On-Chip Wiring for VLSI Status and Directions", <i>IBM J. Res. Dev.</i> , 1990, Vol. 34, pp. 858-867.					
<i>[Signature]</i>	AL	S. P. Muraka, R. J. Gutman, A. Kaloyeros and W. A. Lanford, "Advanced Multilayer Metallization Schemes with Copper as Interconnection Metal", <i>Thin Solid Films</i> , 1994, Vol. 236, pp. 257-266					
<i>[Signature]</i>	AM	K. Holloway, et al., "Tantalum as a Diffusion Barrier Between Copper and Silicon: Failure Mechanism and Effect of Nitrogen Additions," <i>J. Appl. Phys.</i> , 1992 Vol. 71, pp. 5433-5444					
<i>[Signature]</i>	AN	J.O. Olowolafe, C.J. Mogab, R.B. Gregory and M. Kottke, "Interdiffusions in Cu/Reactive-Ion-Sputtered TiN, Cu/Chemical-Vapor-Deposited TiN, Cu/TaN and TaN/Cu/TaN Thin-Film Structures: Low Temperature Diffusion Analyses", <i>J. Appl. Phys.</i> , 1992, Vol. 72, pp. 4099-4103.					
<i>[Signature]</i>	AO	E. Kolawa, "Tantalum-Based Diffusion Barriers in Si/Cu VLSI Metallizations", <i>J. Appl. Phys.</i> , 1991, Vol. 70, pp. 1369-1373					
<i>[Signature]</i>	AP	S.-Q. Wang, et al., "Step Coverage Comparison of Ti/TiN Deposited by Collimated and Uncollimated Physical Vapor Deposition Techniques", <i>J. Vac. Sci. Technol. B</i> , 1996, Vol. 14(3), pp. 1846-1852.					
<i>[Signature]</i>	AQ	J.C. Fuggle et al, "Reactions of Niobium and Tantalum Pentafluorides with Trimethylsilyldiethylamine and with Trimethylsilyl Chloride", 1972, pp. 1766-1767					

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<i>Perfirio Vazquez Gonzalez</i>	4/20/99
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U.S. PATENT DOCUMENTS							
EXAMINER INITIAL		PATENT NUMBER	ISSUE DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
<i>[Signature]</i>	AR	5,034,372	7/23/91	Matsuno et al.	505	1	08/10/98 PM 12:22
<i>[Signature]</i>	AS	5,110,622	5/5/92	Hasegawa et al.	427	126.1	
<i>[Signature]</i>	AT	5,120,703	6/9/92	Snyder et al.	505	1	
<i>[Signature]</i>	AU	5,280,012	1/18/94	Kirlin et al.	505	1	
<i>[Signature]</i>	AV	5,376,409	12/27/94	Kaloyeros et al.	427	248.1	
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		DOCUMENT NUMBER	PUBLICATION DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES NO
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<i>[Signature]</i>	(AW)	K. Hieber, "Structural and Electrical Properties of Ta and Ta Nitrides Deposited by Chemical Vapour Deposition", <i>Thin Solid Films</i> , 1974, Vol. 24, pp. 157-164					
<i>[Signature]</i>	(AX)	R. Fix, R. G. Gordon, D.M. Hoffman, "Chemical Vapor Deposition of Vanadium, Niobium, and Tantalum Nitride Thin Films", <i>Chem. Mater.</i> , 1993, Vol. 5, pp. 614-619					
<i>[Signature]</i>	(AY)	D.N. Williams et al, "Half-sandwich Imido Complexes of Niobium and Tantalum", <i>J. Chem. Soc Dalton Trans.</i> , 1992, pp. 739-751					
<i>[Signature]</i>	(AZ)	J. Li, T. E. Seidel, J. W. Mayer, "Copper-Based Metallization in ULSI Structures", <i>MRS Bulletin</i> , 1994, Vol. XIX, No. 8, pp. 15-18.					
<i>[Signature]</i>	(BA)	S.M. Rossangel, et al., "Thin, High Atomic Weight Refractory Film Deposition for Diffusion Barrier, Adhesion Layer, and Seed Layer Applications" <i>J. Vac. Sci. Technol. B</i> , Vol. 14, pp. 1819-1827					
<i>[Signature]</i>	(BB)	D. Ugolini, S.P. Kowalczyk, F.R. McFeely, "Photoelectron Spectroscopy Studies of Chemical Vapor Deposition of Ta from a TaF ₅ Precursor on Si and SiO ₂ Substrates" <i>J. Appl. Phys.</i> , 1991, Vol. 70, p. 3899.					
<i>[Signature]</i>	(BC)	S.J. McLain, et al., "Multiple Metal-Carbon Bonds. The Reaction of Niobium and Tantalum Neopentylidene Complexes with Simple Olefins: A Route to Metallocyclopentanes", <i>J. Amer. Chem. Soc.</i> , 1977, Vol. 99, p. 3519.					
<i>[Signature]</i>	(BD)	R. R. Schrock, "Alkylidene Complexes of Niobium and Tantalum", <i>Acc. Chem. Res.</i> , 1979, Vol. 12, p. 98.					
<i>[Signature]</i>	(BE)	R. R. Schrock, S.M. Rockledge, "Tantalum Complexes Containing Diimido Bridging Dinitrogen Ligands" <i>J. Amer. Chem. Soc.</i> , 1980, Vol. 102, pp. 7809-7811					
<i>[Signature]</i>	(BF)	Yuan-Wei Chao et al, "Preparation and Properties of Amido Halide Complexes of Niobium and Tantalum and Reactions with Alkynes", <i>Polyhedron</i> , 1990, Vol. 9, No. 22, pp. 2709-2716.					
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U.S. PATENT DOCUMENTS							
EXAMINER INITIAL		PATENT NUMBER	ISSUE DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	BG	4,147,556	4/79	Donley	106	287.18	
	BH	4,281,037	7/81	Choung	427	407.3	
	BI	5,412,129	5/2/95	DiCarolus	556	40	6/17/94
	BJ	5,204,314	4/20/93	Kirlin et al.	505	1	
	BK	5,225,561	7/6/93	Kirlin et al.	546	256	
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		DOCUMENT NUMBER	PUBLICATION DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION YES NO
OTHER DOCUMENTS (Including Author, Title, Journal-Date, Page Number, Etc.)							
	BL	John D. Prostasiewicz, "Synthesis and Structural Characterization of Low Valent Group V Phosphine Complexes", <i>Inorg. Chem.</i> , 1992, Vol. 31, pp. 4134-4142.					
	BM	D.C. Bradley et al, "Nuclear Magnetic Resonance Studies on Niobium and Tantalum Penta-alkoxides", <i>J. Chem. Soc. (A)</i> , 1968, pp.219-223					
	BN	M.H. Tsai, S.C. Sun, C.P. Lee, H.T. Chiu, C.E. Tsai, S.H. Chuang, S.C. Wu, "Metal-Organic Chemical Vapor Deposition of Tantalum Nitride Barrier Layers for ULSI Applications", <i>Thin Solid Films</i> , 1995, Vol. 270, pp. 531-536.					
	BO	H.T. Chiu, W.P. Chang, "Effect of Hydrogen on Deposition of Tantalum Nitride Thin Films From Ethylimidotantalum Complex", <i>J. Mater. Sci. Lett.</i> , 1992, Vol. 11, pp. 570-572.					
	BP	K. Sugiyama, et al., "Low Temperature Deposition of Metal Nitrides by Thermal Decomposition of Organometallic Compounds", <i>J. Electrochem. Soc.</i> , 1975, Vol. 122, p. 1545.					
	BQ	M.G. Simmonds, W.L. Gladfelter, "Chemical Vapor Deposition of Aluminum", <i>The Chemistry of Metal CVD</i> , T.T. Kodas, M.J. Hampden-Smith, Eds., VCH, New York, 1994.					
	BR	T.D. Tilley, <i>The Chemistry of Silicon Compounds</i> , S. Patai, Z. Rappoport Eds., Wiley: New York, 1989, Vol. 2. P. 1415					
	BS	Q. Jiang, P.J. Carroll, D. H. Berry, "Synthesis of Mono- and Bis(silyl) Complexes of Tantalum" <i>Organometallics</i> , 1991, Vol. 10, pp. 3648-3655					
	BT	"Diffusion Barriers for GaAs and InP Devices", <i>NASA, Tech Briefs</i> , June 1997, p. 42.					
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EXAMINER <i>Pauline Negarin</i>					DATE CONSIDERED 4/20/99		
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U.S. PATENT DOCUMENTS							
EXAMINER INITIAL		PATENT NUMBER	ISSUE DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
<i>[initials]</i>	BU	4,401,474	8/83	Donley	106	243	
<i>[initials]</i>	BV	4,726,938	2/88	Rollat, et al.	423	DIG.14	
<i>[initials]</i>	BW	4,898,842	2/90	David	501	12-X	
<i>[initials]</i>	BX	4,908,065	3/90	Tanitsu et al.	106	287.19-X	
<i>[initials]</i>	BY	5,165,960	11/24/92	Platts	427	166	
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<i>[initials]</i>	BZ	"Adherent and Stable Metallization of CVD Diamond", <i>NASA Tech Briefs</i> , June 1997, pp. 63-64.					
<i>[initials]</i>	CA	M.F. Lappert, et al, <i>Metal and Metalloid Amides</i> , John Wiley and Sons, pp. 470-543.					
<i>[initials]</i>	CE	R.P.M. Werner, A.H. Filbey, S.A. Manastyrsky, "Tetracarbonylcyclopentadienyl Compounds of the Group V Transition Metals", <i>Inorg. Chem.</i> , 1964, Vol. 3, pp. 298-300					
<i>[initials]</i>	CC	Z. Xue, L. Li, L. K. Hoyt, J.B. Diminnie, J.L. Pollitte, "Early Transition Metal Silyl Complexes Free from Anionic Π -Ligands. A new Family of Alkyl, Alkylidene, and Alkylidyne Compounds", <i>J. Am. Chem. Soc.</i> , 1994, Vol. 116, pp. 2169-2170					
<i>[initials]</i>	CD	W.A. Nugent, R.L. Harlow, "Structure and Reactivity in the Group 5B t-Butylimido Complexes $(Me_2N)_3M=Nbu$ "; X-Ray Crystal and Molecular Structure of N-t-Butylimidotris(dimethylamido)tantalum", <i>J.C.S. Chem. Comm.</i> , 1978, pp. 579-580.					
<i>[initials]</i>	CE	A.A. Finn, L. Brandt, H.D. Kaesz, R.F. Hicks, "Chemical Vapor Deposition of Platinum, Palladium and Nickel", <i>The Chemistry of Metal CVD</i> , T.T. Kodas, M.J. Hampden-Smith, Eds., VCH, New York, 1994.					
<i>[initials]</i>	CF	Pradeep P. Phule, "Sol-gel Synthesis of Ferroelectric Lithium Tantalate Ceramics: FTIR Investigation of the Molecular Modification of Tantalum Ethoxide", <i>J. Mater. Res.</i> , 1993, Vol.8, No. 2, pp. 334-338					
<i>[initials]</i>	CG	P.N. Kapoor et al, "Organic Compounds of Niobium and tantalum IV Reactions of Niobium and Tantalum Pentaethoxides with B-Diketones", <i>J. of the Less- Common Metals</i> , 1965, Vol. 8., pp. 339-346					
<i>[initials]</i>	CH	R.L. Deutsher, et al, "Eight Coordinate Tetrakis-Chelate Complexes of Niobium(IV) and Tantalum(V)", <i>Inorganica Chimica Acta</i> , 1970, pp. 645-650					
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U.S. PATENT DOCUMENTS							
EXAMINER INITIAL		PATENT NUMBER	ISSUE DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
<i>[Signature]</i>	CI	3,988,332	1977 10/19/76	R. R. Schrock	260	429 R	
<i>[Signature]</i>	CJ	4,510,222	4/9/85	Okunaka et al.	430	5	
<i>[Signature]</i>	CK	4,529,427	7/16/85	French	65	3.12	
<i>[Signature]</i>	CL	5,679,815	10/21/97	Kirlin et al.	556	42	
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<i>[Signature]</i>	CM	R.R. Schrock et al, "Multiple Metal Carbon Bonds. "Preparation and Characterization of Formation of the Tantalum and Niobium Neopentylidene Complexes, M (CH ₂ Cme ₃) ₃ (CHCMe ₃)", J. Amer. Chem. Soc., 1978, Vol. 100:11, pp. 3359-3370.					
<i>[Signature]</i>	CN	Mark M. Bonaszak Holl, "Ladder Structure of [(BuCH ₂) ₂ TaN]5·NH ₃ ·2C ₇ H ₈ and Its relationship to Cubic TaN", J. Am. Chem. Soc., 1990, Vol.112, pp. 7989-7994.					
<i>[Signature]</i>	CO	Malcolm H. Chisolm, et al, "Chloro(dimethylamido) Compounds of Tantalum(V): Preparations, Properties, and Structures of [Ta(NMe ₂) ₃ Cl ₂], TaCl ₃ (NMe ₂) ₂ (HNMe ₂), Ta(NMe ₂) ₃ Cl ₂ (HNMe ₂), and [TaCl ₂ (NMe ₂) ₂ (HNMe ₂)] ₂ O" <i>Inorganic Chemistry</i> , 1981, Vol. 20, pp. 1859-1865.					
<i>[Signature]</i>	CP	H.-K. Shin, et al., "MOCVD of Titanium Nitride from a New Precursor, Ti[N(CH ₃)C ₂ H ₅] ₄ ", <i>Chem. Mater.</i> , 1997, Vol. 9, pp. 76-80.					
<i>[Signature]</i>	CO	T. Kee, <i>Coordination Chemistry</i> , 1993, pp. 171-185.					
<i>[Signature]</i>	CR	M. Stolz, K. Heiber, "Universal Chemical Vapour Deposition System for Metallurgical Coatings", <i>Thin Solid Films</i> , 1983, Vol. 100, pp. 209-218.					
<i>[Signature]</i>	CS	T. Don Tilley, "The Reactivity of Transition Metal-Silicon Compounds", Final Technical Report, Defense Technical Information Center, AD Number A200371, 1988 August 8.					
<i>[Signature]</i>	CT	M.H. Tsai, S.C. Sun, C.P. Lee, H.T. Chiu, S.H. Chuang, "Metalorganic Chemical Vapor Deposition of Tungsten Nitride for Advanced Metallization", <i>Appl. Phys. Lett.</i> , 1996, Vol. 68, pp. 1412-1414					
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	(CU) (CV) (CW) (CX) (CY) (CZ) (DA) (DB) (DC)	<p>M.H. Tsai, S.C. Sun, H.T. Chiu, C.E. Tsai, S.H. Chuang, "Metalorganic Chemical Vapor Deposition of Tantalum Nitride by Tertbutylimidotris(diethylamido)tantalum for Advanced Metallization" <i>Appl. Phys. Lett.</i>, 1995, Vol.67, pp. 1128-1130.</p> <p>S.C.Sun et al, "Diffusion Barrier Properties of CVD Tantalum Nitride for Aluminum and Copper Interconnections", VMIC Conference, 1995 ISMIC, June 27-29, pp. 157-161.</p> <p>H.T. Chiu, S. H. Chuang, "Tungsten Nitride Thin Films Prepared by MOCVD", <i>J. Mater. Res.</i>, 1993, Vol.8, pp. 1353-1360.</p> <p>P. Catania, et al., "Low Resistivity Body-Centered Cubic Tantalum Thin Films as Diffusion Barriers Between Copper and Silicon", <i>J. Vac. Sci. Tech.</i>, A, 1992, A10 pp. 3318-3321</p> <p>E. Blanquet, et al., "Evaluation of LPCVD Me-Si-N (Me=Ta, Ti, W, Re) Diffusion Barriers for Cu Metallizations", <i>Microelectronic Engineering</i>, 1997, Vol. 37, pp. 189-195.</p> <p>Y.W. Chao, et al., "Preparation and Properties of Tantalum Imido Complexes and Their Reactions with Alkynes. Coordination Control through Multiple Metal-Ligand Bonding", <i>Inorg. Chem.</i>, 1989, Vol. 28, pp. 3860-3868.</p> <p>M. M. Banaszak, et al., "Ammonolysis of Tantalum Alkyls: Formation of Cubic TaN and a Trimeric Nitride, [Cp*MeTa₃N]₃", <i>Inorg. Chem.</i> 1990, Vol. 29, pp. 1518-1526.</p> <p>Zhang, J. et al., "Single Liquid Source Plasma-Enhanced Metalorganic Chemical Vapor Deposition of High Quality YBa₂Cu₃O_{7-x} Thin Films," <i>Appl. Phys. Lett.</i>, 1992, Vol. 61, pp. 2884-2886.</p> <p>Van Buskirk, P.C. et al., "MOCVD Growth of BaTiO₃ in an 8" Single-Wafer CVD System," Proc. ISAF 92, Eighth Int'l Symp. Appl. Ferroelectrics, Agu. 31-Sept. 2, 1992.</p>					
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	(DD) Hiskes, R. et al., "Single Source Metalorganic Chemical Vapor Deposition of Low Microwave Surface Resistance $\text{YBa}_2\text{Cu}_3\text{O}_7$," Appl. Phys. Lett. 1991, Vol. 59, pp. 606-607.
	(DE) Zhang et al., "Plasma Enhanced Metalorganic Chemical Vapor Deposition of Conductive Oxide Electrodes for Ferroelectric BaTiO_3 Capacitors." Mater. Res. Soc. Symp. Proc. Vol. 310, pp. 249-254 (1993).
	(DF) Zhang et al., "Metal Organic Chemical Vapor Deposition of LaSrCoO Electrodes for Ferroelectric Capacitors," 6th ISAF Mtg., March, 1994
	(DG) T. Suzuki, "Comparison of CVD TiN , PECVD WN_x and CVD W-Si-N as Upper Electrode Materials for Ta_2O_5 DRAM Capacitors", Advanced Metallization Conference, Sept 28 1997, San Diego.
	(DH) S.Q. Wang, "Barriers Against Copper Diffusion into Silicon and Drift Through Silicon Dioxide", MRS Bulletin, August 1994, pp. 30-40.
	(DI) D.C. Bradley, M.H. Chisholm, "Transition Metal Dialkylamides and Disilylamides", Accounts of Chemical Research, 1976, Vol. 9, pp.273-280.
	(DJ) S.-Q. Wang, et al., "Film Property Comparison of Ti/TiN Deposited by Collimated and Uncollimated Physical Vapor Deposition Techniques", J. Vac. Sci. Technol. B, 1996, Vol. 14(3), pp. 1837-1845
	(DK) F.W. Ainger, et al., "Deposition of Ferroelectric Oxides by MOCVD.", Prog. Crystal Growth Charact., 1991, Vol. 22, pp. 183-187.
	(DL) Narula, et al., "Preparation and Characterization of Niobium(V) β -Diketonates", Synth. React. Inorg. Met. Org. Chem, 1983, Vol. 13, pp. 1-19.
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